Optimal Aerodynamic Forms for High-Lift, Low-Drag Planetary Entry

Completed Technology Project (2011 - 2015)

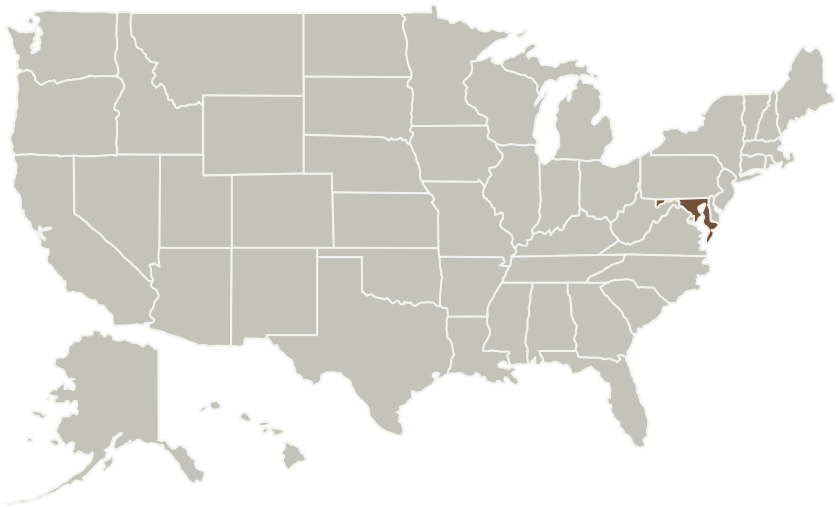
Project Introduction

This proposed effort will examine high-lift forms that can use aerodynamics to maneuver in planetary atmospheres, decelerate gradually from space, or to enter from orbital trajectories in ways not available to blunt forms. The potential benefits of such high lift-vehicles include a wide range of planetary applications, including atmospheric survey missions and trajectories to the outer solar system in which aerodynamic forces augment planetary gravity for increased delta-v. This proposed effort will take a multidisciplinary approach to the optimization of high lift-to-drag ratio interplanetary vehicle designs, tailored to the specific requirements of the atmospheres of the other planets in our solar system. Primary effort will focus on the class of shapes known as 'waveriders', designed inversely from known shock flowfields. Optimization routines will be adopted which value not only high-lift, low-drag forms coupled on an optimized trajectory, but also the design's stability performance.

Anticipated Benefits

The potential benefits of such high lift-vehicles include a wide range of planetary applications, including atmospheric survey missions and trajectories to the outer solar system in which aerodynamic forces augment planetary gravity for increased delta-v.

Primary U.S. Work Locations and Key Partners



Project Image Optimal Aerodynamic Forms for High-Lift, Low-Drag Planetary Entry

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Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Responsible Program:

Space Technology Research Grants

Optimal Aerodynamic Forms for High-Lift, Low-Drag Planetary Entry

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Organizations Performing Work	Role	Type	Location
University of Maryland-College Park(UMCP)	Supporting Organization	Academia	College Park, Maryland

Primary U.S. Work Locations
Maryland

Images

4259-1363263030616.jpg
Project Image Optimal Aerodynamic Forms for High-Lift, Low-Drag Planetary Entry
(https://techport.nasa.gov/image/1809)

Project Website:

https://www.nasa.gov/directorates/spacetech/home/index.html

Project Management

Program Director:
Claudia M Meyer

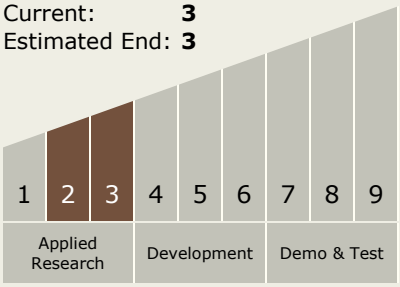
Program Manager:
Hung D Nguyen

Principal Investigator:
Ken Yu

Co-Investigator:
Jeremy M Knittel

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



Technology Areas

Primary:

- TX01 Propulsion Systems
  - TX01.3 Aero Propulsion
    - TX01.3.1 Integrated Systems and Ancillary Technologies